MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

DBM5014 – BUSINESS MATHEMATICS

(All Sections)

21 OCTOBER 2019

2.30 pm – 4.30 pm

(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 3 pages excluding cover page and appendix.
2. Attempt **ALL FOUR (4)** questions. The distribution of marks for each question is given.
3. Write all your answers in the Answer Booklet provided.
4. Key formulae are given in the Appendix.

Question 1

a) Given the following inequalities:

$$x + y \leq 60$$
$$x + 3y \leq 90$$
$$x \geq 0, y \geq 0$$

i. Find the x and y intercepts for all the inequalities above. (4 marks)

ii. Sketch and shade the feasible region that satisfies the inequalities above. (3 marks)

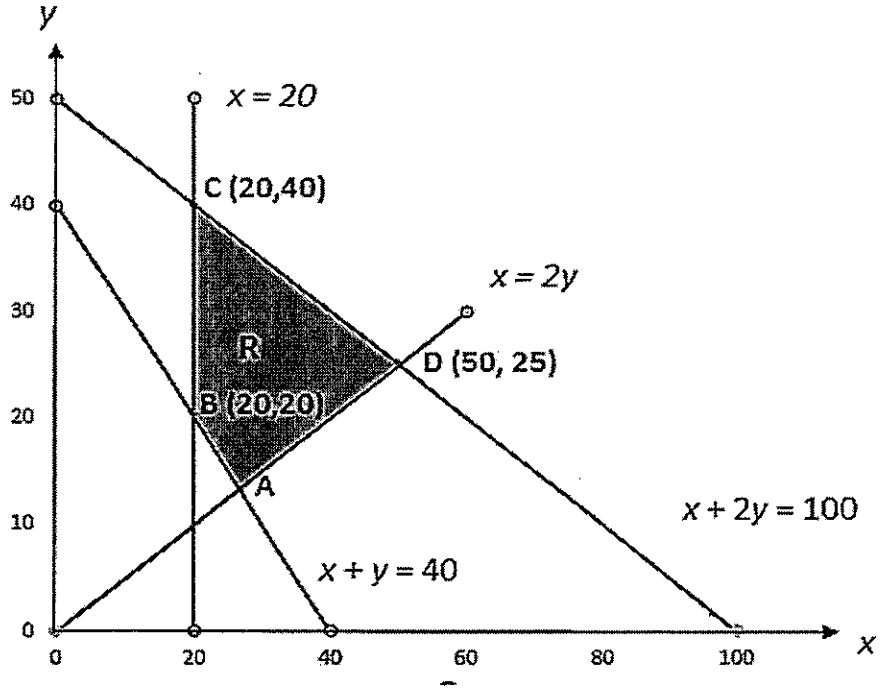
b) Café Jazs makes two types of muffin, Choco (x) and Rasp (y). Choco requires 100g of flour and 20g of sugar whereas Rasp requires 50g of flour and 20g of sugar. In the store, Jazs only has 5000g of flour and 2000g of sugar. Number of Choco muffins produced are at least two times the number of Rasp muffins.

i. Write three inequalities, other than $x \geq 0$ and $y \geq 0$, which satisfy all the above constraints. (3 marks)

ii. Identify the profit function, P = Ax + By if the profit for each Choco muffin and Rasp muffin is RM3 and RM2, respectively. (1 mark)

iii. If Jazs sells 40 Choco muffins and 20 Rasp muffins, what is the maximum profit? (2 marks)

c) Given the following graph of x and y.



i. Find the coordinate of Point A. (6 marks)

ii. Evaluate each corner points by using the function Z = 5x + 4y. (4 marks)

iii. Identify the maximum point and minimum point. (2 marks)

[TOTAL: 25 MARKS]

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Question 2

a) Nicholas Nair won the first prize of Math Wiz Competition held at Multimedia University. He received a cash prize of RM70,000. If he spent RM16,480 and put the balance into a saving account with interest rate of 3.01% p.a. compounded monthly, what will be the amount in his saving account after 15 years? (5 marks)

b) Stephen Tan has just started working and he would like to buy a car. He has two options.

Option	Description
1	Buy new local car costing RM66,000 by taking car loan at 3.05% simple interest per year.
2	Buy used import car at a lower price of RM48,000 using personal loan at 8.88% p. a. compounded monthly.

Both options require Stephen Tan to pay deposit of 10% from the selling price. If he is willing to pay the loan for 7 years, help him to calculate the followings.

i. The deposit he needs to pay for both options. (2 marks)
ii. The future value of the loan for Option 1. (3 marks)
iii. The monthly payment for Option 1. (2 marks)
iv. The monthly payment for Option 2. (5 marks)
v. Which option pays less monthly payment for Stephen Tan? (1 mark)

c) Imran will retire in 37 years. He planned to have RM1,000,000 in his saving account when he retires. He found a bank that gives 4.12% p.a. interest rate compounded quarterly.
i. How much money should he deposit every quarter to reach his retirement plan? (5 marks)
ii. Calculate the amount of interest he earned. (2 marks)

[TOTAL: 25 MARKS]

Question 3

a) Find $\frac{dy}{dx}$ of $y=\frac{1}{x^{2019}}+2019e^{x}-2019\ln x-2019$. (4 marks)

b) Use **Product Rule** to differentiate $y=(5-4x^{3})(2x-7)$. (7 marks)

c) Given a function $y=\frac{1}{3}(3x^{3}-5)^{-2019}$.

i. Differentiate the above function by using **Chain Rule**. (7 marks)

ii. Hence, from answer in part (i), identify the value of m and n if $\frac{dy}{dx}=\frac{mx^{2}}{(3x^{3}-5)^{n}}$. (2 marks)

d) The total cost function for a manufacturer is given by $C(x)=\frac{2}{5}x^{5}-3e^{x}+6$ where C is in RM. Find the marginal cost when 5 units are produced. (5 marks)

[TOTAL: 25 MARKS]

Continued...

Question 4

a) Evaluate each of the following indefinite integral.

i. $\int\left(\frac{2}{x^5}-\frac{3}{4}e^x+\frac{4}{x}-3x^2+11\right)dx$ (5 marks)

ii. $\int\left(\frac{xe^x-x^3+x^{1/5}+x+10}{x}\right)dx$ (5 marks)

b) Calculate $\int_2^{10}(x-2)dx+\int_2^4 2x^3dx$. (5 marks)

c) Solve $\int\frac{45}{(5x+2)^9}dx$ by using the **Substitution Rule**. (6 marks)

d) Given the marginal cost function is $\frac{dc}{dq}=4q^3+2$.

i. Find the cost function. (2 marks)

ii. Evaluate the cost function from 10 to 20 units. (2 marks)

[TOTAL: 25 MARKS]

End of Paper.

APPENDIX – FORMULAE

Effective Rate	
$r_e = \left(1+\frac{r}{n}\right)^n - 1$	
Simple Interest $I = Prt$	**Future Value** $FV = PV\left(1+\frac{r}{n}\right)^{n\times t}$
Present Value Annuity $A = R\left[\frac{1-\left(1+\frac{r}{n}\right)^{-n\times t}}{\frac{r}{n}}\right]$	**Future Value Annuity** $S = R\left[\frac{\left(1+\frac{r}{n}\right)^{n\times t}-1}{\frac{r}{n}}\right]$

Derivatives

1. $\frac{d}{dx}\left(ax^n\right) = anx^{n-1}$	2. $\frac{d}{dx}[g(x)]^n = n[g(x)]^{n-1}\cdot g'(x)$
3. $\frac{d}{dx}[f(x)g(x)] = f(x)g'(x)+g(x)f'(x)$	4. $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x)-f(x)g'(x)}{[g(x)]^2}$

Logarithmic Functions	Exponential Functions	Chain Rule
$\frac{d}{dx}(\ln x) = \frac{1}{x}$	$\frac{d}{dx}\left(e^x\right) = e^x$	$\frac{dy}{dx} = \frac{dy}{du}\cdot\frac{du}{dx}$
$\frac{d}{dx}\ln u = \frac{1}{u}\cdot\frac{du}{dx}$	$\frac{d}{dx}e^u = e^u\frac{du}{dx}$	

Integration

1. $\int k dx = kx + C$	2. $\int ax^n dx = \frac{ax^{n+1}}{n+1} + C, \quad n \neq -1$
3. $\int e^x dx = e^x + C$	4. $\int \frac{1}{x} dx = \ln x + C$
Definite Integral, $A = \int_a^b f(x)\,dx = F(b) - F(a)$	